PORTABLE NON-DESTRUCTIVE TESTING DEVICE BASED ON SERIAL MOBILE DEVICES

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Wireless data technologies are now used in all technical fields, from cell phones to auto-pilot cars. Wireless technologies are also being actively used in nondestructive testing [1].

Most often in in nondestructive testing, data transmission over wireless networks is used over short distances (via bluetooth) [2], but there are also exceptions (GSM / HSPA). The combination of these technologies in one device is truly universal and necessary in some cases [3]. This problem can be solved by using a separate bluetooth module sensor and a smartphone.

The sensor collects primary information about the testing object and provides data transmission over short distances by separate data packets collected over a certain period of time or in Real-time mode. The smartphone receives a data packet from the sensor and allows it to process the results of the on-site testing, or using GSM technology to transmit the processed data to generate a report or compile a testing map.

Modern smartphones exceed some computers in their computing capabilities. In addition, using such a mobile platform has greater advantages. Modern smartphones allow using not only bluetooth and GSM but also Wi-Fi and more advanced and secure HSPA and LTE data transfer protocols. Also a major advantage of this approach is the ability to update software wireless.

The main idea of the proposed development is to use a sensor consisting of a primary converter, a microcontroller and a Bluetooth module with a smartphone. Such a system may perform a function of a full flaw detector, which is able to generate reports, process the received signal according to user settings and synchronize with cloud services. This is possible through the use of a smartphone with the proposed system.

Modern smartphones running on the Android operating system have the ability to simultaneously connect up to twenty-eight such sensors. Unfortunately, it is not possible to receive data from all sensors at the same time because of the features of Bluetooth technology, and sensors cannot be connected in parallel, so it is difficult to work with so many sensors in real time. At the same time, this scheme is excellent for static use, and allows checking the state of the object for a slight delay even at distances of a hundred meters or more when using Bluetooth Specification 5.0.

Let's consider the structural scheme of the created ultrasonic flaw detector with wireless data transmission (Fig. 1).

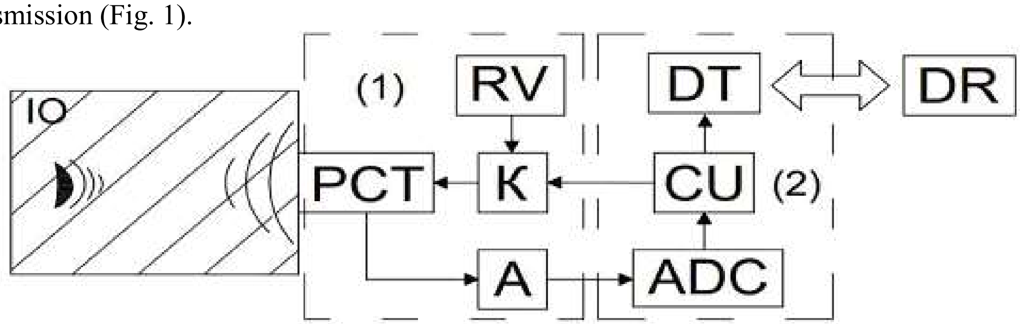

Fig. 1. Structural diagram of ultrasonic defectoscope

The converter unit can be divided into two parts: analog (1) and digital (2). An analog incorporates a shock excitation generator, represents as a piezoelectric converter (PCT), which is fed through the key (K) by the reference voltage (RV). The frequency of generator is set by a short pulse supplied from the control unit (CU). The generated impulse propagates in the object of testing (IO). It is reflected and re-enters the PEC after reaching the bottom surface or defect. The resulting echo pulse has a small amplitude, so before digitizing it must be amplify (A). The main task of the digital part (2) is to convert an analog signal to a digital (ADC) and, to transmit it to the information processing unit (DR) through the information transfer unit (DT).
On the basis of this structural scheme a model of mobile ultrasonic flaw detector was created, the general appearance of which is presented in Fig. 2.

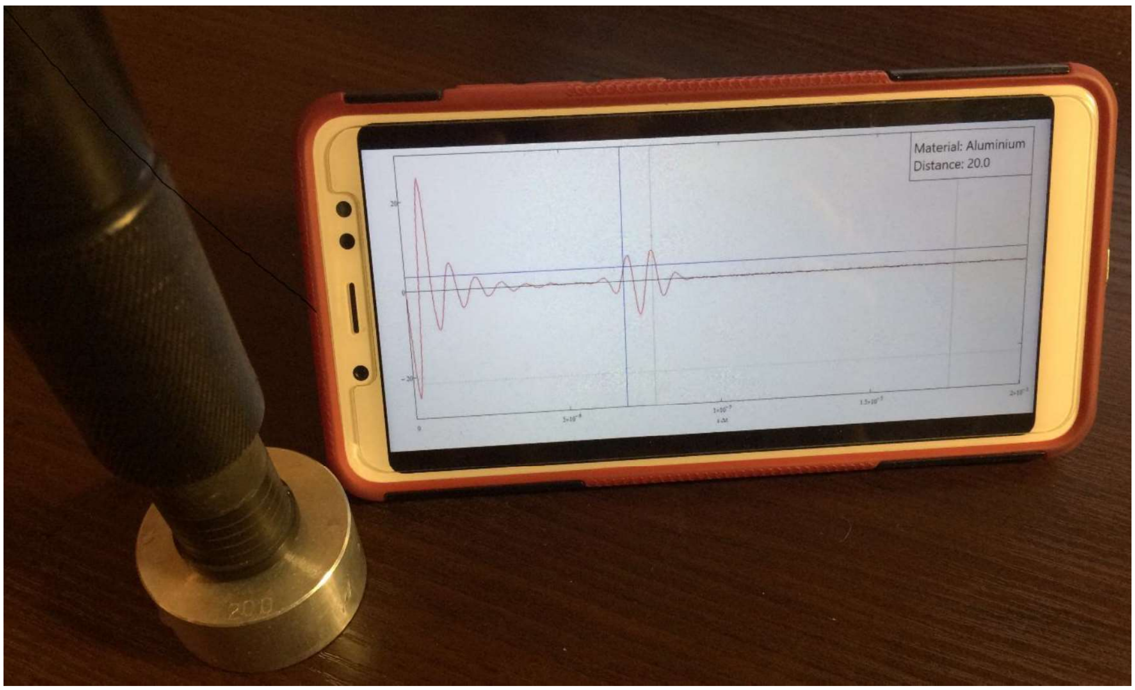

Fig. 2. Experimental setup

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